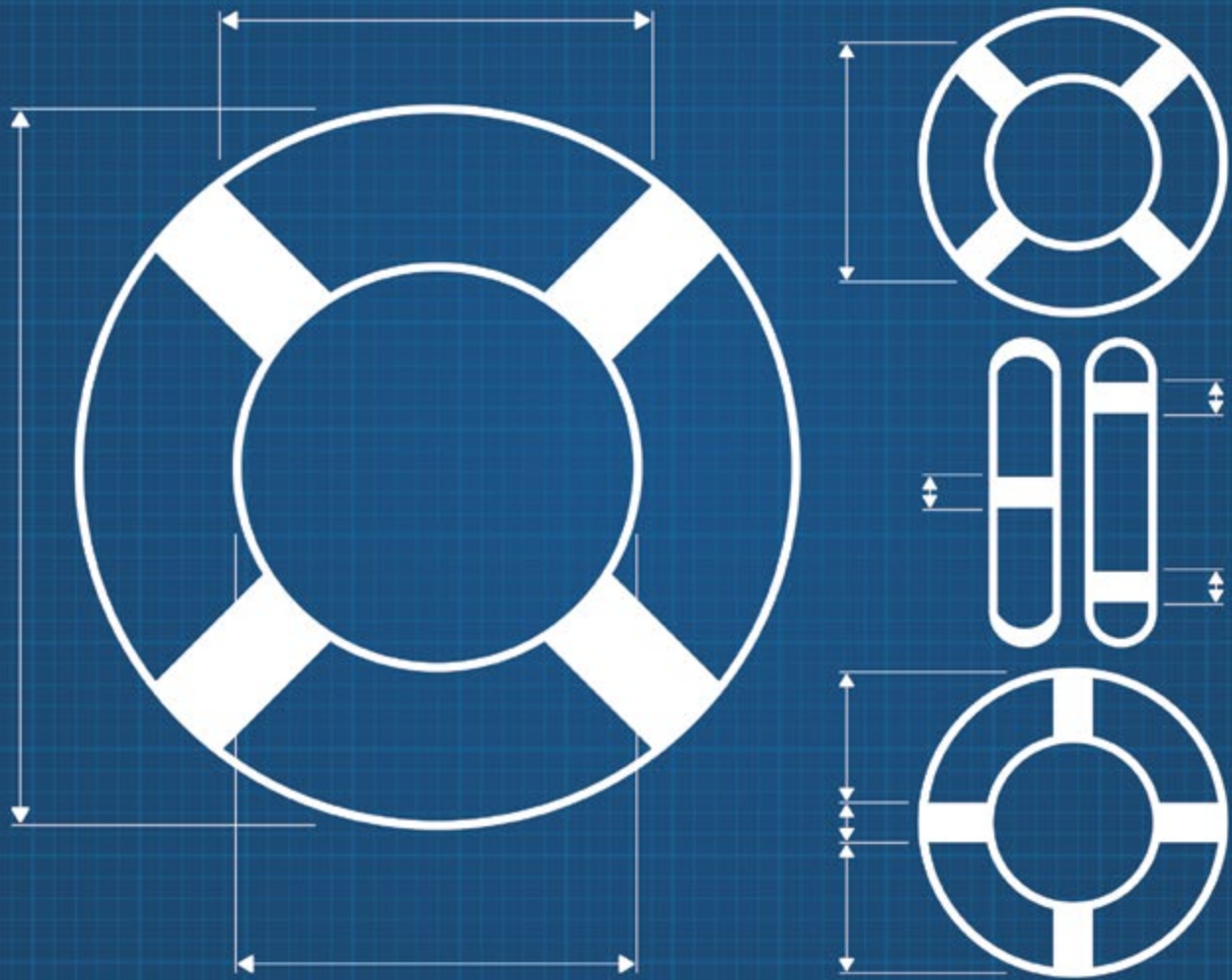


# ENGINEERING

## STRONG SUMMER STEM



**PARTNERSHIP FOR  
CHILDREN & YOUTH**

JULY 2015

# ENGINEERING STRONGER EXPANDED LEARNING PROGRAMS: LESSONS FROM SUMMER STEM

The students in our schools today will inherit daunting environmental and technical challenges. Will they be prepared?

Educators know that STEM (science, technology, engineering, and math) skills are critical to student success today and absolutely necessary for children to meet tomorrow's challenges and compete in the 21st Century economy. What many might not realize is how those same skills can be used to engineer innovative programs and develop staff expertise in order to give every student the chance to thrive and succeed.

The Summer STEM Project, led by the Partnership for Children and Youth (PCY), guided school district and community partners through an engineering approach in order to design and improve summer learning programs that taught STEM skills. The learning results of this ground-breaking three-year initiative were remarkable for students and staff members. In addition, the participating organizations learned how to create and continuously improve innovative and ambitious summer learning programs that also strengthened afterschool programs run throughout the school year.

Central to the success of the project was its focus on the hands-on learning and exploration that make STEM subjects exciting for both child and adult learners. This report summarizes what the participants learned, describes the challenges involved in engineering this initiative, and provides advice for other communities interested in creating stronger expanded learning programs.

# THE FOCUS ON STEM LEARNING CREATES AN IMPETUS FOR CHANGE

Schools face growing pressure to think differently and to maximize their use of every moment of learning time for students, in part because of the demand for students to develop STEM skills. That challenge provided the catalyst for this project, enabling PCY to apply its tested strategies and substantial expertise to a new area.

PCY's Summer STEM Project operated for three summers—in 2012, 2013, and 2014—and engaged 3rd to 5th grade students in interesting and challenging STEM activities. The central goal was for the students to gain knowledge and confidence, going back to school with greater interest in these subject areas.

The project represented an engineering challenge that quickly exposed strengths and weaknesses in staff members' classroom management and program practices. The activities themselves required extensive materials, complex projects, and carefully sequenced segments. It was crucial to develop the capacity of non-credentialed summer program staff, supported by credentialed teachers and program managers, to teach STEM subjects in a program that was fun and engaging, but also provided substantial learning.

Taking a page from good engineering practice, the Summer STEM Project involved several important processes:

- ① Convening partners with different strengths and knowledge
- ② Identifying the challenge and defining success
- ③ Brainstorming to design a possible solution
- ④ Engaging in a continuous cycle of quality improvement, involving planning, implementation, and assessment to refine the design

These same processes can be used to initiate and improve a broad spectrum of expanded learning projects that have clear, demanding goals for students and staff. In fact, with the signing of SB1221 in the fall of 2014, this process of quality improvement is a requirement for California Department of Education expanded learning grantees.

## CONVENING PARTNERS WITH DIFFERENT STRENGTHS AND KNOWLEDGE

Providing high quality STEM instruction through a summer learning program was an ambitious project. It required a mix of content, youth development, and instructional coaching, all with a focus on quality and continuous improvement. The participants found that several partners could imagine and implement a more powerful project when they worked together because of the synergy they were able to create.

PCY served as the organizing force behind the project, bringing the partners together and linking with other statewide expanded learning networks. Along with identifying funding sources, PCY contributed its growing expertise, gained as lead agency for California's Summer Matters campaign.

**Three different communities and four school districts** used their summer learning programs to offer low-income students and English learners solidly-grounded experiences that were challenging and engaging, drawing kids to attend multiple years. The Oakland and Mount Diablo Unified School Districts were involved all three years, while two sites in San Jose joined the project in year two. All enlisted their existing and stable afterschool programs and staff providing a solid foundation for developing this new program. The districts also provided teachers from their school-day programs as instructional coaches.

### THE SUMMER STEM PROJECT COMMUNITIES

On average, the programs served about 100 students per site. The programs generally ran for six hours per day and lasted four weeks.

Communities participating during the summer of 2014 included:

- Oakland Unified School District—358 participants at three school sites.
- Mt. Diablo Unified School District—583 participants at five school sites.
- San Jose- CORAL/Franklin-McKinley SD and Washington Center—232 participants at two sites.

**Techbridge** provided the subject matter expertise and curriculum for the Summer STEM Project. Throughout the project they worked to develop the knowledge of staff members and also adapted the curricular approach over time to more effectively meet the needs of the participating communities.

During the course of the three-year project, PCY made sure each summer program staff received:

- Technical assistance during their planning and implementation processes
- Staff coaching related specifically to the STEM curriculum during the summer program itself
- Support related to program evaluation and the use of that information to refine and improve the next year's efforts

“ The partnership was key. Between PCY, Techbridge, and the group here at Mount Diablo we had great communication, open dialog, and regular meetings. Having a collaborative group works really well, because you have someone who you know will be there to do the training and walk everyone through the planning, implementation, and evaluation processes. ”

*Terri Porter, District Coordinator of Afterschool Programs, Mount Diablo USD*



## IDENTIFYING THE CHALLENGE AND DEFINING SUCCESS

**Make sure the engineering challenge is clear.** For the Summer STEM Project, PCY wanted to use a model of continuous improvement and a hands-on curriculum to create a summer program, run by an afterschool staff that would engage students and teach STEM topics effectively.

**Decide together what success will look like.** Partners need to work together to agree on the goals for the project and a plan for measuring progress toward those goals. For this project the desired outcomes included:

- Increasing students' interest and confidence in STEM learning.
- Increasing line staff's ability and confidence to teach STEM lessons in summer and afterschool.
- Developing a replicable and sustainable system of technical assistance for expanded learning programs in other communities with learning goals including STEM and other content areas.

## BRAINSTORMING TO DESIGN A POSSIBLE SOLUTION

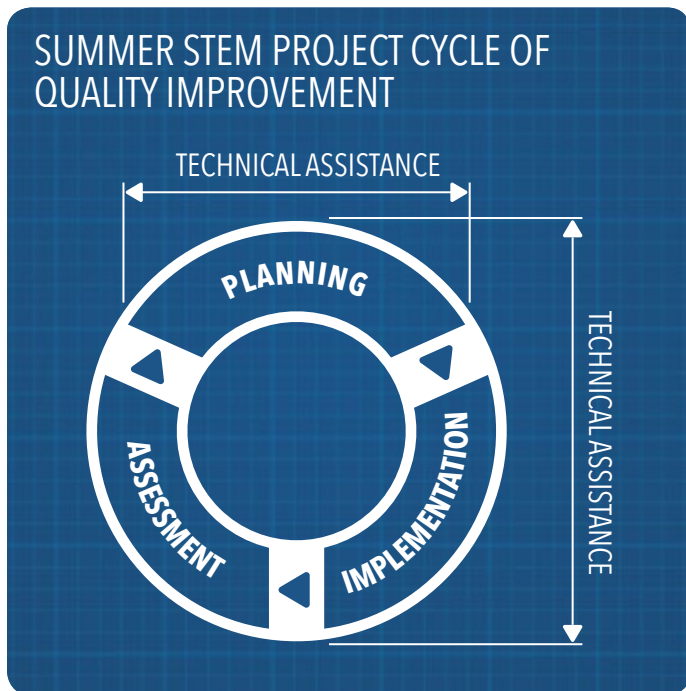
**Create an initial project design.** Designing the Summer STEM Project first required the partners to address fundamental questions about how the project as a whole and each local community's programs would operate, such as:

- What STEM curriculum would be used?
- What school sites would be included?
- How would the STEM component be integrated into the rest of the summer program?
- What combination of certificated and afterschool line staff made sense?
- What training would the staff need before the program started?
- What coaching during the program itself was possible, reasonable, and appropriate?

**Accept that the project will evolve over time.** The first year of the Summer STEM Project served as a pilot. In the fall of 2011, PCY convened the partners to design the project. Over the next two years, with the basic parameters in place, the project increasingly focused on the questions of quality improvement, curriculum, program planning, and ongoing coaching. The partners also needed to think about long-term sustainability through a diversified funding base.

## ENGAGING IN A CONTINUOUS CYCLE OF QUALITY IMPROVEMENT

The initial theory was that school site staff could use a quality improvement approach—involving cycles of **planning, implementation, and assessment**—to develop and sustain a high-quality program. Further, the partners believed that what the program managers and staff learned could materially improve their afterschool programs the rest of the year. At the core of the effort was the conviction that a strong system of technical assistance and coaching would enable local expanded learning program staff to teach potentially difficult topics effectively and consistently over time.



Over the three years the project partners learned a lot about using the “plan-implement-assess” cycle in order to leverage summer learning programs as opportunities for testing innovations and strengthening staff skills. Ultimately, the Summer STEM Project created systems for improving program quality and learning experiences year round.

“It’s September, summer is starting.”

*PCY staff to school district teams involved in the Summer STEM Project.*

“It makes a huge difference when you plan ahead. It starts by setting clear but realistic goals for the summer program. Then you tie everything you’re planning, including your unit plans, into those bigger program goals and to the district’s broader learning goals. It’s all very intentional.”

*Ann Ngo, Site Director,  
East Bay Agency for Children (EBAC)  
at East Oakland Pride*

### PLAN

**Summer learning program planning must start early.** Beginning in September makes it possible to hold monthly planning meetings year-round, plan for and hire the program staff months in advance, and conduct line staff training well before the summer program begins. As a result, planning is thoughtful and reflective while not swamping the calendars of busy school district, school site, and organizational leaders.

With ample planning time, technical assistance providers can also make sure their work is aligned with program goals, including improvement goals. Doing that work in the fall makes it possible to provide necessary program planning supports to the district and program management in the winter.

During the Summer STEM Project the planning included agreement on the coaching, quality reviews, and data gathering that would take place during the program. That paved the way for a strong and effective staff training schedule in the spring and leading up to the programs’ June start dates.

**Stable, committed funding facilitates the planning process.** Knowing that a program will continue for multiple years, and with relatively stable program leadership, makes it possible to plan every aspect of the program more effectively and proactively.

## A SUGGESTED PLANNING FRAMEWORK AND TIMELINE FOR A SUMMER PROGRAM THAT STARTS IN JUNE

### SEPTEMBER-NOVEMBER

- ▶ Evaluate past and current experiences by reflecting on the framework for improvement and the timeline.
- ▶ Create a planning calendar and hold sites accountable to meet the planning deadlines.

### NOVEMBER-JANUARY

- ▶ Select or hire program managers and site coordinators for the summer program.
- ▶ Establish summer planning team to include directors, managers, coordinators, teachers, and/or school administrators.

### JANUARY-MARCH

- ▶ Hire line staff for the summer program and any remaining staff or contractors.
- ▶ Communicate with school site administration and teachers—and through them with the community—about the program plans, dates, and enrollment capacity.

### MARCH-MAY

- ▶ Involve line staff in selecting topics and preparing their lesson plans.
- ▶ Hold content related and general summer training sessions.

### MAY-END OF SUMMER PROGRAM

- ▶ Make sure the necessary equipment and supplies are gathered and organized well ahead of time, in the case of hands-on activities in general and science in particular.
- ▶ Hold regular check-in meetings to debrief logistics, lessons, and overall program strengths plus areas for improvement.

## IMPLEMENT

Observing practices and making mid-course corrections during a relatively short summer program requires both a commitment to quality improvement and a solid, nimble system of communication before the program even starts. Experiences during the three-years of the Summer STEM Project helped the partners find some keys for meeting this objective.

**The staff must be prepared for observations and coaching**, viewing it as a positive, constructive, and routine part of the program. A straightforward observation protocol can support this when it is related to overall program quality and implemented by the technical assistance providers. The first few days of the program, observers should visit and make straightforward suggestions for improvement based on what they see.

For the Summer STEM Project, these observations were called “48 hour reports” and were quickly delivered to the program leader and staff. They highlighted areas of strength and areas for improvement, with the note that the suggestions are given based on the potential to implement immediately and/or prior to the close of the summer session. As might be expected, some staff members were initially anxious at the idea of being observed and given feedback. The resistance quickly dissipated when staff understood that the changes being suggested would improve their practice, and that coaches were available to support them in the process.

“Once the program starts, everything is flying 100 miles per hour.”

*Sara Reyes, Senior Division Director of Children, Youth, and Family Development, Catholic Charities of Santa Clara County*



**Suggestions made during a brief summer program must be straightforward and immediately actionable.** Given the challenges inherent in hands-on learning activities, and the complexity of topics such as STEM, instructional coaching for summer line staff can be appropriate and helpful.

Certificated educators can be effective in this role, observing a lesson and then debriefing with the staff member immediately afterward. This direct and timely support builds staff capacity and encourages staff reflection at the time they are running the programs, enabling them to make adjustments in their approach immediately.

**Evidence from multiple sources should be gathered during the program.** By using a variety of tools, program partners are able to develop a summative look at where the program as a whole successfully meets its goals and where it needs to improve. The tools should include program observations, student and staff surveys, student assessments, document reviews, and in-depth interviews with key staff members and technical assistance providers.

“ Program staff who were initially resistant quickly changed their opinions. The moment the data was received and discussed, they flipped the switch, ‘Oh, I get this. This is going to be really, really helpful.’ ”

*Andrea Broxton, Director of Planning and Technical Assistance, Partnership for Children and Youth.*

“ I was there as a safety net if the staff member was having trouble with a lesson. They were really open to the coaching. Sometimes they would come to me and explain a challenge they were having with a student or a lesson. It was about solving problems. ”

*Enedina Sandoval, Teacher and Summer Coach, Global Family School in Oakland*

## ASSESS

**The assessment phase is critical and primarily takes place after the program ends.** With access to multiple data sources collected during and immediately after the program, partners are able to identify areas of strength and opportunities for improvement. This intentional phase sets the stage for planning and implementation the next year. It can also prompt changes in staffing, program delivery, technical assistance, and supports needed by program leaders.

One example of this pivotal shift from the Summer STEM project was the curriculum itself. On the one hand, the lessons needed to provide sufficient guidance to a summer program staff with no special training in science. On the other hand, good science education is open-ended with the instructor acting as a facilitator who can follow up on student ideas and pose new questions over the course of an activity. After running head-on into this challenge during the pilot year, the project began adapting its approach. By year three, the now-experienced program staff began developing their own lesson plans and were increasingly proactive in how they taught the material.

Through the continuous cycle of planning, implementation, and assessment, programs like those in the Summer STEM Project can deliver appropriate curriculum, professional development and coaching, as well as key technical assistance to program managers. This process builds staff confidence and program quality both in the summer and throughout the school year.



## ALWAYS MORE TO LEARN

Watching the students and staff in action during these summer programs, it was clear that they were grappling with challenging issues related to learning and teaching STEM. In the process, both students and staff were building confidence in their skills and ability. Less obvious, but perhaps more important, was the infrastructure of technical assistance that led up to these four-week programs. It took ten months of comprehensive planning to achieve these learning goals for students and staff. It also produced a shift in the program culture, allowing managers and staff to understand and embrace the cycle of quality improvement, a process that is essential to long-term effectiveness and sustainability.

“ If an afterschool program ever wants to try something new, it makes sense to use four weeks in summer to test it out. It’s a finite amount of time and then you can see what worked and what didn’t. You carry the successes through to the school year. For example, the kids in summer all wore program T-shirts. It’s a simple thing that made a big difference in their attitudes. Now we do that in afterschool and we see the same good effects. ”

*David Becerra, Summer Program Consultant,  
Love. Learn. Success., East Oakland Pride.*

## STAFF SKILL AND STABILITY ARE FOUNDATIONAL

All three communities that were part of the Summer STEM Project benefitted from the solid infrastructure, collaborative partnerships, and quality improvement processes that already existed in their afterschool programs. The leaders concurred that the project required having an experienced, knowledgeable staff who knew how to run a program and also had the creative freedom to show initiative and make decisions around program implementation and delivery.

At the core of staff skill and stability was their rooted understanding of, and experience in, youth development. PCY’s review of the field observations and program surveys revealed a consistently strong correlation between staff’s youth development knowledge base and their willingness and capacity to receive and use feedback. Throughout the course of the project, this was reflected in the staff’s ability and confidence to try new strategies or concepts regardless of pre-existing experience with STEM education or content.

“ If you have a solid team and a strong core program, then you can add something like this science component successfully. ”

*Sara Reyes, Senior Division Director of  
Children, Youth, and Family Development,  
Catholic Charities of Santa Clara County*



# THE SUMMER STEM PROJECT DELIVERED LONG TERM BENEFITS

## ▶ STUDENTS REPORTED POSITIVE GAINS RELATED TO SCIENCE

Based on survey results, the vast majority of students said their confidence and interest in STEM topics had increased.

*The great majority of youth reported that the program positively influenced their attitudes toward STEM learning*

**91%** SCIENCE WAS MORE FUN

**89%** SCIENCE WAS MORE INTERESTING

*The program also impacted students' interest in future science learning*

**83%** WANT TO LEARN MORE ABOUT SCIENCE

**82%** ARE MORE EXCITED TO LEARN ABOUT SCIENCE IN SCHOOL

**93%** THE PROGRAM TAUGHT THEM NEW THINGS

**80%** THE ACTIVITIES TAUGHT THEM THINGS THAT MATTERED TO THEM

**77%** SHARED WHAT THEY LEARNED WITH THEIR FAMILIES

## ▶ STUDENTS CARRIED NEW KNOWLEDGE AND CONFIDENCE INTO THE SCHOOL YEAR

Linda Barker, principal of Kennedy Elementary School in San Jose's Franklin McKinley School District, reported that teachers at this STEM magnet school saw the program's impact. "Our teachers told me that during science, kids would say 'oh I know this, we did this in summer camp.' Because of that summer experience the kids were really motivated and the level of learning was much higher. The second year the teachers were pushing to get their kids into the program because they knew how beneficial it was for them academically."

## ▶ STAFF GAINED CONFIDENCE IN THEIR ABILITY TO TEACH SCIENCE

Results from surveys of the line staff who led the program activities, most of whom also work in afterschool programs in the same communities, indicated increased confidence in leading STEM activities. At the end of the summer, staff reported that they had themselves gained knowledge about STEM and teaching strategies.

*Staff who reported that they could effectively lead summer STEM activities*

INCREASED FROM **69%** ▶ **95%**

*Staff who reported that they could continually find better ways to lead STEM activities*

INCREASED FROM **79%** ▶ **95%**

*Staff who reported that they understand STEM concepts well enough to be effective in leading summer STEM activities*

INCREASED FROM **88%** ▶ **95%**

*Staff who reported that when leading a summer STEM activity, they welcome questions from children and youth*

INCREASED FROM **81%** ▶ **95%**

## ENGINEERING NEW GOALS FOR EXPANDED LEARNING PROGRAMS PAYS OFF

When the Summer STEM Project began, success was not a foregone conclusion. The partners had critical questions about whether afterschool staff could succeed at teaching science lessons and the extent to which what was learned in summer could help strengthen the year-round program. The three summers of the project were a learning experience for all involved.

Those experiences contain lessons for schools and community based organizations that want to think more expansively about learning opportunities for their students, whether in STEM or other subject areas.

- Start with an experimental design or pilot that is small enough in scope to be manageable but that creates authentic experiences for all involved.
- Give yourself time to plan.
- Find partners you can work with, and who will function as critical relationships.
- Be thoughtful and intentional about your goals, and systematic in evaluating both your successes and opportunities to improve.
- Give your staff the imperative and structure for self-reflection and continuous improvement.
- Reflect on what you learn and use it to make the program better.
- Persist and have confidence that you and your staff will continue to learn and improve.



This report documents why and how STEM education can be successfully integrated into summer learning programs. The significant positive impacts on students and expanded learning staff are echoed year-round. Together, the school day and expanded learning time can maximize opportunities for students.

The Summer STEM program results should inspire confidence in school leaders who want to further their STEM education goals, and otherwise strengthen student outcomes. Much is possible with a proactive investment in summer learning programs and the strategic use of the afterschool platform and hours beyond the school day and year. By the same token, expanded learning providers should also be strategic about engaging in STEM education and building quality.

## RESOURCES

### **PARTNERSHIP FOR CHILDREN & YOUTH (PCY)**

[partnerforchildren.org](http://partnerforchildren.org)

### **SUMMER MATTERS**

[summermatters2you.org](http://summermatters2you.org)

### **SUMMER MATTERS TA MANUAL**

[asapconnect.org/ta-manual](http://asapconnect.org/ta-manual)

### **NATIONAL SUMMER LEARNING ASSOCIATION (NSLA)**

[summerlearning.org](http://summerlearning.org)

### **ASAP CONNECT**

[asapconnect.org](http://asapconnect.org)

### **TECHBRIDGE**

[techbridgegirls.org](http://techbridgegirls.org)

### **PUBLIC PROFIT**

[publicprofit.net](http://publicprofit.net)

### **CALIFORNIA AFTERSCHOOL NETWORK (CAN)**

[afterschoolnetwork.org](http://afterschoolnetwork.org)

### **POWER OF DISCOVERY: STEM<sup>2</sup>**

[powerofdiscovery.org](http://powerofdiscovery.org)

### **CALIFORNIA AFTERSCHOOL RESOURCE CENTER (CASRC)**

[californiaafterschool.org/stem\\_resources](http://californiaafterschool.org/stem_resources)

### **CALIFORNIA STEM LEARNING NETWORK (CSLNet)**

[cslnet.org](http://cslnet.org)

### **CALIFORNIA SCHOOL-AGE CONSORTIUM (CALSAC)**

[calsac.org](http://calsac.org)

### **CLICK2SCIENCE**

[click2sciencepd.org](http://click2sciencepd.org)

### **STEM IN AFTERSCHOOL SYSTEM-BUILDING TOOLKIT**

[expandingstemlearning.org](http://expandingstemlearning.org)

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PCY would like to thank all the individuals, organizations, districts, and partners who dedicated their time, knowledge, and enthusiasm to the Summer STEM project. Your work has inspired us and is the impetus for this brief. We would especially like to thank Mary Perry who helped us to illustrate the promising practices that stemmed from the project through her invaluable writing. From our initial conception to the final iteration, her collaboration was instrumental to the ideas put forth in the brief.

## ABOUT PCY

**ABOUT PARTNERSHIP FOR CHILDREN & YOUTH**  
Partnership for Children & Youth is a California-based non-profit organization that finds funding, partners, and solutions to help schools better serve students, and informs state and national public policy on education issues. Our mission is to ignite systems of continuous learning, foster collaboration, and build leadership among school districts, government agencies, and community based organizations serving low income children and youth. For more information, please visit our website: [www.partnerforchildren.org](http://www.partnerforchildren.org)

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